



**NOAA
FISHERIES**

**Alaska
Fisheries
Science
Center**

EFH and Corals

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Ecosystem Science Review
Juneau, Alaska
May 2-6, 2016

Background - EFH and Corals

- EFH and Corals managed under 2006 MSA
- Corals are vulnerable to damage, long-lived, slow to recover
- May provide essential habitat for some fish and crab species (reduced mortality)
- Need to identify EFH for all species and life history stages for FMP species
 - Current EFH designations are undescribed or level 1
 - EFH designations are mandated to be improved as new information comes available (reviewed in AK on 5 year cycle)
- EFH has been rationale for coral closures in past
- NPFMC has authority to close areas to protect coral

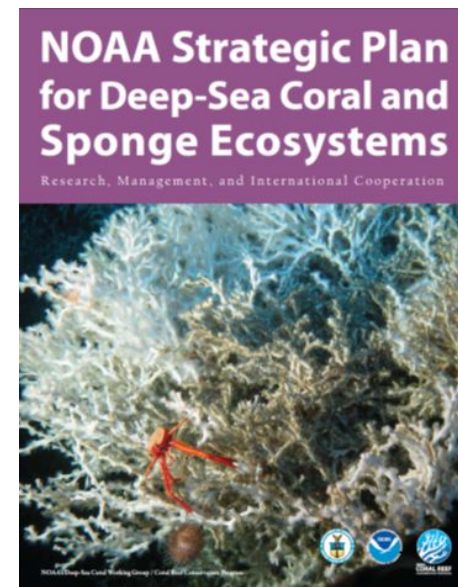
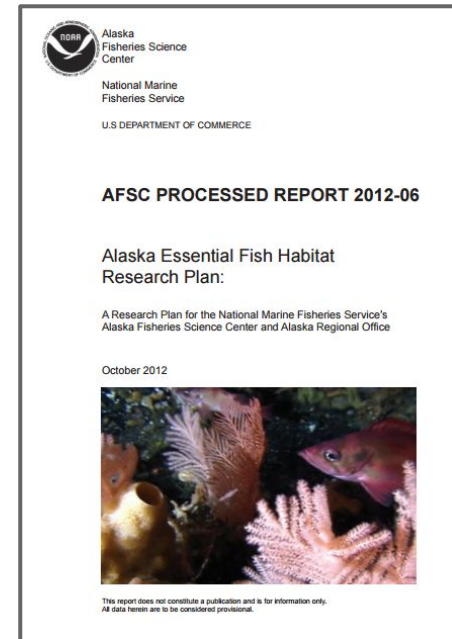
Funding

EFH Funding

- Administered by AKRO & AFSC
- ~\$250-500K annually
- Competition based on research priorities
- ~ 5-8 projects funded per year

Alaska Coral and Sponge Initiative

- Funding from Deep Sea Coral Research and Technology Program
- Specifically for coral research (rotates)
- \$2.6 million over 3 years (FY12-14)
- 10 projects funded
- Allocated by cross-cutting team (NMFS, NOS, OAR)



More background - Coral

Knowns-

- Alaska one of the most diverse areas in world for deep-sea coral (Aleutians particularly)
- Commercially important species have strong associations with coral (juvenile POP)
- Studies were mostly conducted on small “postage stamps” indicated coral importance, diversity and vulnerability (SE Alaska Primnoa thickets)
- Where postage stamps indicated high abundance, closures were applied (HAPC closures in the Aleutians)

Known unknowns-

- Alaska-wide distribution of corals
- Where spatial management would be most effective
- How much coral should we be protecting to maintain fisheries production
- How much coral was currently protected

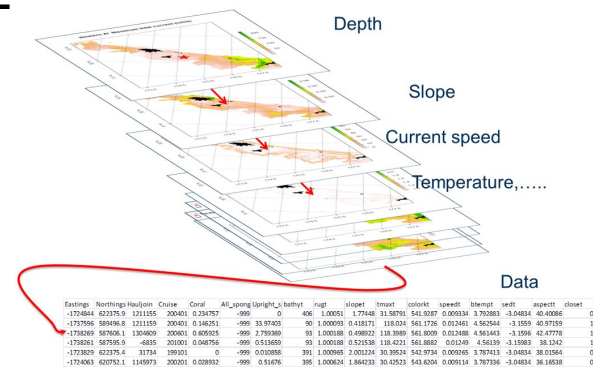
Objectives - Coral

Alaska Coral and Sponge Initiative: Where do coral habitats occur and how likely are they to be vulnerable to fishing and other activities?

- Provide model-based maps of the distribution of vulnerable habitats in GOA and AI
- Ground truth those models with visual information
- Look at diversity, size structure as indication of vulnerability
- Overlay with fishing information to examine potential areas of interest

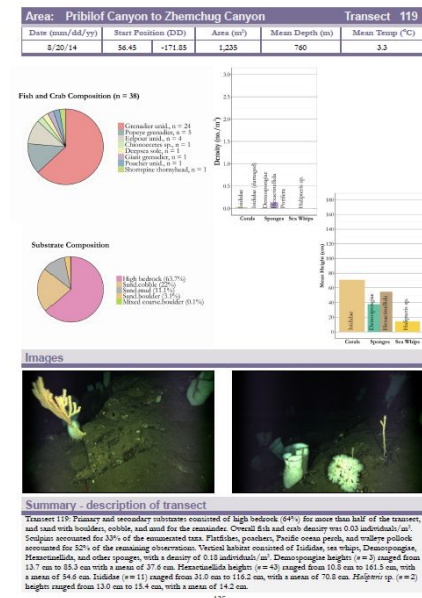
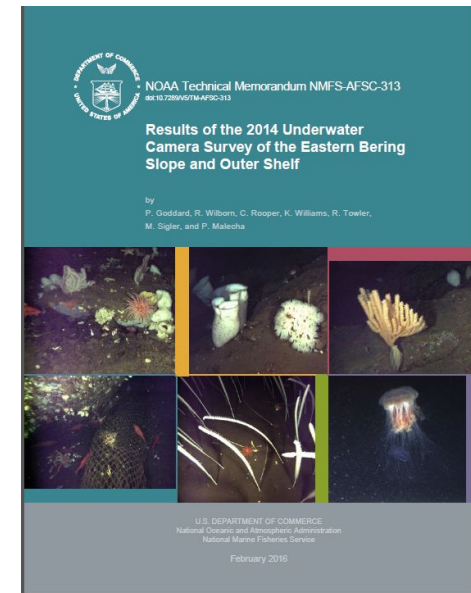
Data acquisition and management

- **GOA, EBS & AI bottom trawl survey data (1991-2014)**
 - (n ~ 10K)
- **Habitat variables** (Point data - raster layers 100 m x 100 m grid)
 - bathymetry, variables derived from bathymetry, ROMS outputs, tidal current outputs, MODIS data, sediment data, temperature
- **Model predictions** - raster grids (100 m x 100 m)
- **Groundtruth data (2012-2014)** - images, count, density, size data
 - n = 468 transects
- Acquisition strategies
 - Trawl survey - well established for stock assessment activities
 - Habitat variables - mostly established (trawl surveys, model outputs from other sources, bathymetry)
 - Groundtruth data - published protocols on stereo cameras, calibration, image analysis software, etc. - mostly since 2012
- Data management strategies in place
 - Trawl survey data
 - Some environmental variables
 - Raw images (kind of)



Status of ecosystem data

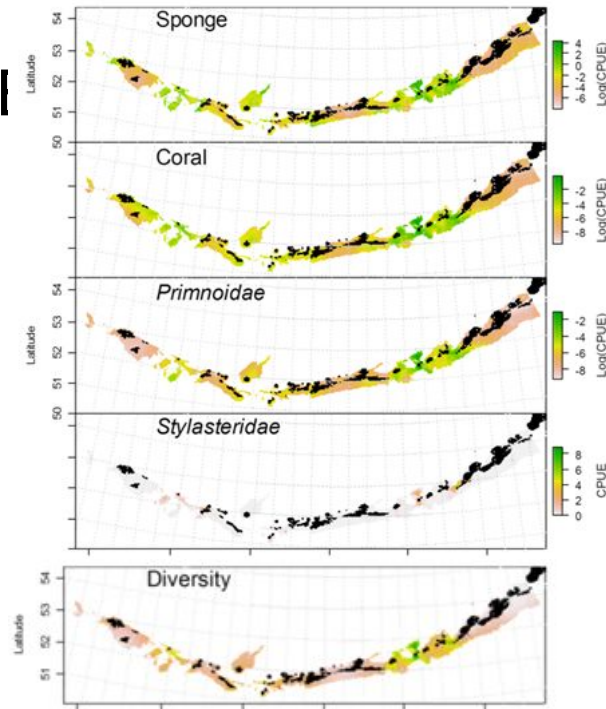
- Trawl survey data - currently in RACEBASE
 - AKFIN database
 - RACE trawl survey data portal
- Bathymetry, sediment and derived products (AI and parts of GOA)
 - RACE website (<http://www.afsc.noaa.gov/RACE/groundfish/Bathymetry/default.htm>)
- ROMS model outputs - PMEL
- Model outputs - RACE
 - some variation at Deep Sea Coral Program data portal (<https://deepseacoraldata.noaa.gov/>)
- Image data - RACE
 - non-zero sponge, coral observations at Deep Sea Coral Program data portal
 - Tech memo with derived data by transect (EBS complete, AI in June)



Inclusion into management advice

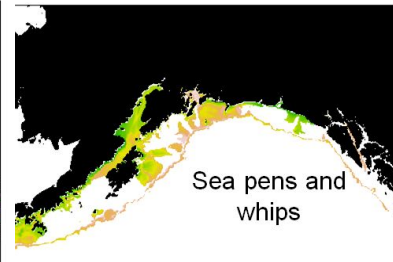
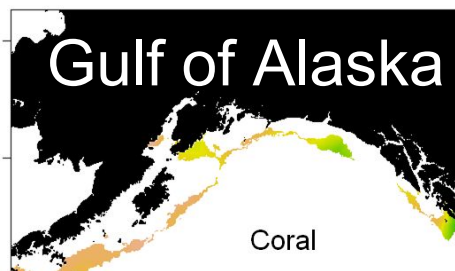
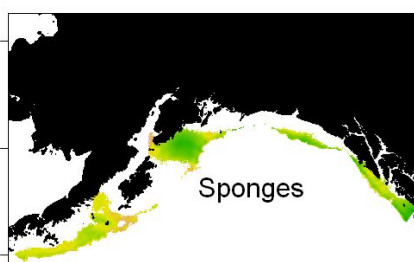
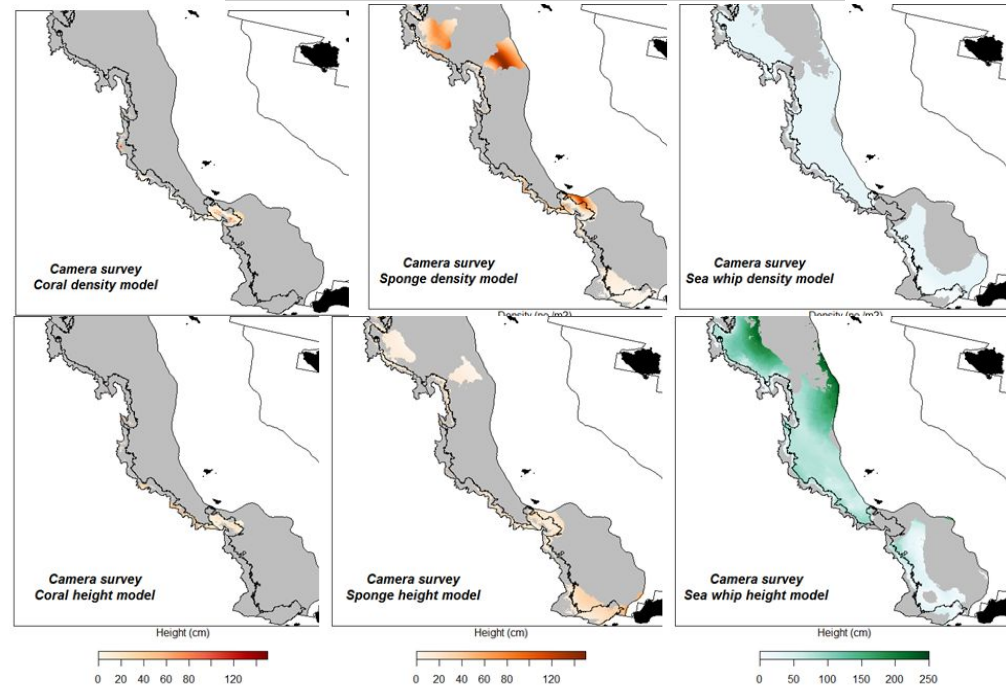
What did we produce?

Maps on 100 m x 100 m grid for all of Alaska showing distribution and abundance of corals



Aleutian Islands

Eastern Bering Sea

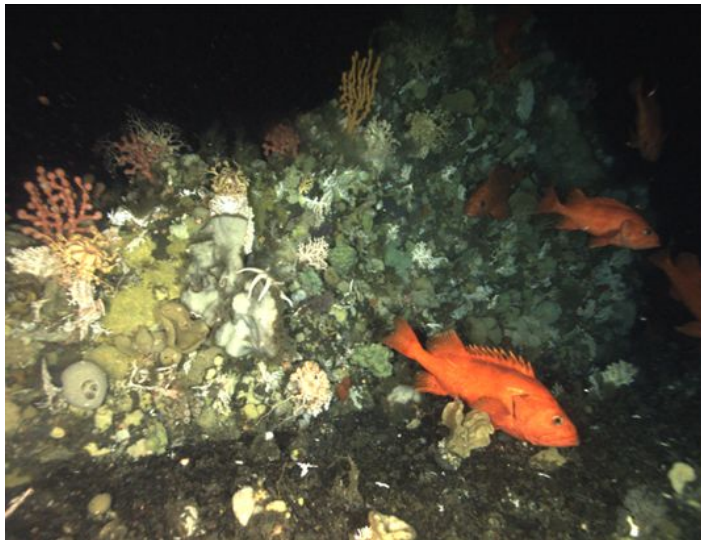


Inclusion into management advice

What did we produce?

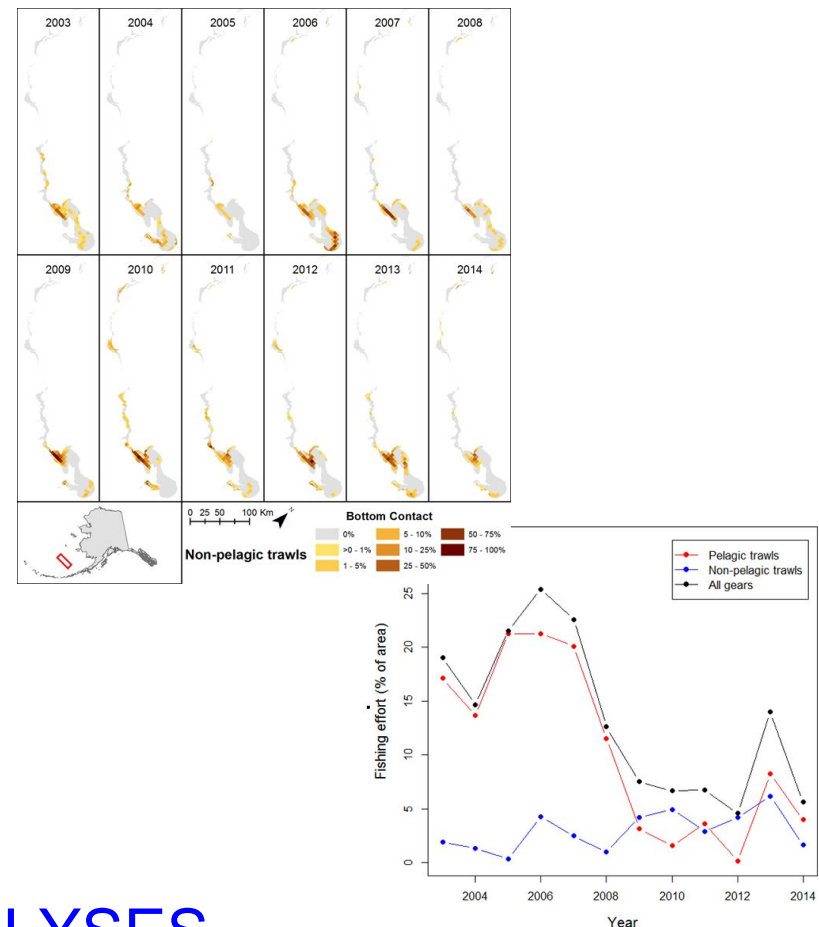
Overlap and potential vulnerability to commercial fisheries (size & density)

Aleutian Islands



46% of Aleutians < 500 m
protected
including 51% of total coral
habitat

Eastern Bering Sea



ONGOING ANALYSES

Where has this information been included in management advice?

1. NPFMC decision to not close proposed areas of Pribilof and Zhemchug canyons in EBS
2. EFH-Environmental Impact Statement - Fishing effects modeling (2016)
3. Evaluation of effectiveness of closed areas in the Aleutian Islands (ongoing)
4. CPUE of coral is an ecosystem indicator (SAFE - Ecosystem Considerations chapter)

How was inclusion decided?

1. NPFMC requested the analysis and information
2. Alaska Regional office provided funding and analysis
3. NPFMC listed as a priority for habitat research (author decision to pursue)
4. SSC and NPFMC requested the information

Peer review paths

NPFMC products - peer review by SSC

- a. EBS Canyons mapping and analysis documents (2013-2016)
- b. AI and GOA modeling and ground-truthing plans (2012-2013)
- c. Coral CPUE as ecosystem indicator (SAFE Ecosystem Considerations)
- d. EFH-EIS fishing impacts (eventually or currently)

Science products - peer review through publication

Generally parallels NPFMC products

Product	EBS Modeling and Ground-truthing	GOA Modeling	AI Modeling and Ground-truthing
Peer reviewed manuscript	2	1 (in prep)	1 (& 1 in prep)
NOAA Tech. Memo	1		1 in prep

Communication to managers, partners, stakeholders and the public

EBS Canyons Outreach - high profile

2013

- public presentations (UAF, UW, RACE Seminar, AK-AFS, others)
- NPFMC June (AP, SSC, EC, NPFMC)
- Individual outreach to Industry and NGO with report and data prior to June meeting
- QR story, press release

2014

- workshop (Feb NPFMC meeting)
- public presentations (RACE Seminar)
- NPFMC update (October)
- press release, web story, media interviews

2015

- public presentations (AFSC Seminars, EC) n = 3
- Industry meetings (FLC, PCC, MCA, FMI)
- NGO meetings (GP, WWF, Oceana)
- media interviews, multiple press releases
- data release - March, report release June (web)
- NPFMC October - final action (SSC, AP, NPFMC)

2016

- NPFMC clean-up (April)

Alaska Coral Project Outreach - medium profile

2012

- NPFMC December (AP, SSC, EC, NPFMC)

2013

- RACE Seminar
- QR Feature
- NPFMC December (SSC, EC)
- Industry presentation (FLC)

2014

- limited image data release
- model release
- RACE Seminar
- Mostly science seminars (PICES, DSC RTP, NOS)

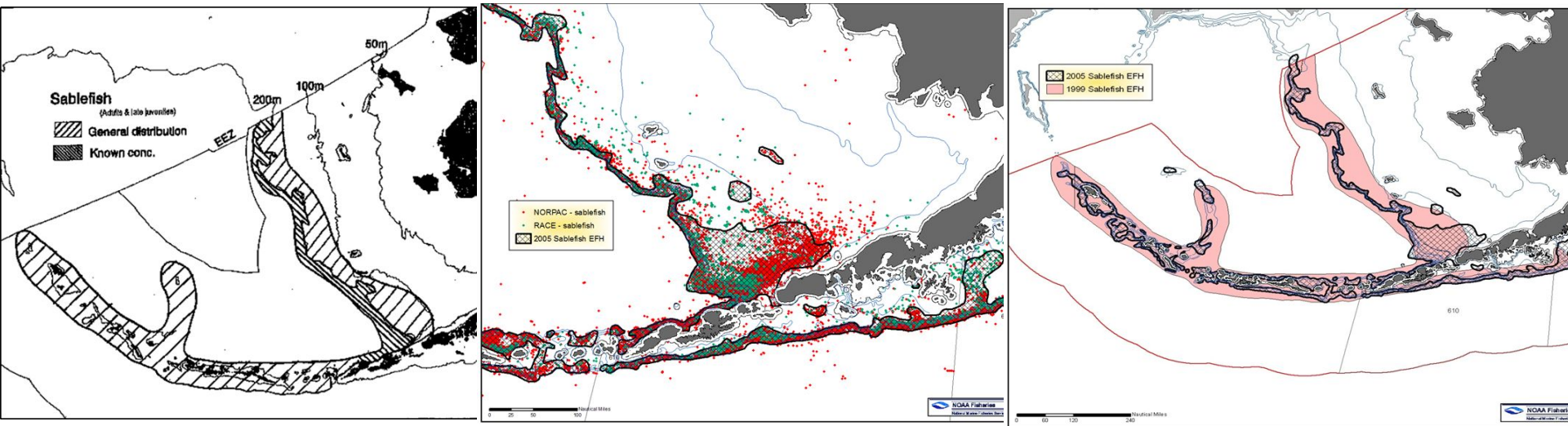
2016

- International Coral Symposium
- Final report release
- data release to DSC RTP

More background - EFH

Knowns-

- For most FMP species
 - Distribution of catches mapped
 - Verbal descriptions of known early life history stages



Known unknowns-

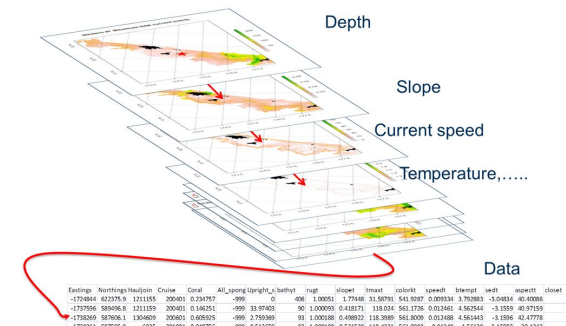
- What is happening outside summer season
- What about not-so-important FMP species (i.e. not pollock)
- What are the important variables controlling distributions
- What is the potential effect of climate change on EFH

Objectives - EFH Descriptions

- Move EFH Descriptions from undescribed or level 1 to level 1 or 2 for all species
 - By region
 - By life history stage
 - By season
- Determine relationships between habitat and fish abundance
- Provide model based maps for decision making
- Models for predicting distribution under climate change scenarios

Data acquisition and management

- **Response data (GOA, EBS and AI)**
 - Bottom trawl survey data (1982-2014)
 - Early life history data (1994-2015)
 - Fishery observer data (2005-2013)
- **Habitat variables** (Point data - raster layers 100 m x 100 m grid)
 - bathymetry, variables derived from bathymetry, ROMS outputs, tidal current outputs, MODIS data, sediment data, trawl survey environmental data
- **Model predictions** - raster grids (100 m x 100 m)
- **Species Distribution Models** - GAM, hurdle GAM, Maximum Entropy
- **Model validation** - by partitioning data
- Acquisition strategies
 - Trawl survey - well established for stock assessment activities
 - Habitat variables - mostly established (trawl surveys, model outputs from other sources, bathymetry)
- Data management strategies in place
 - Trawl survey data
 - Some environmental variables



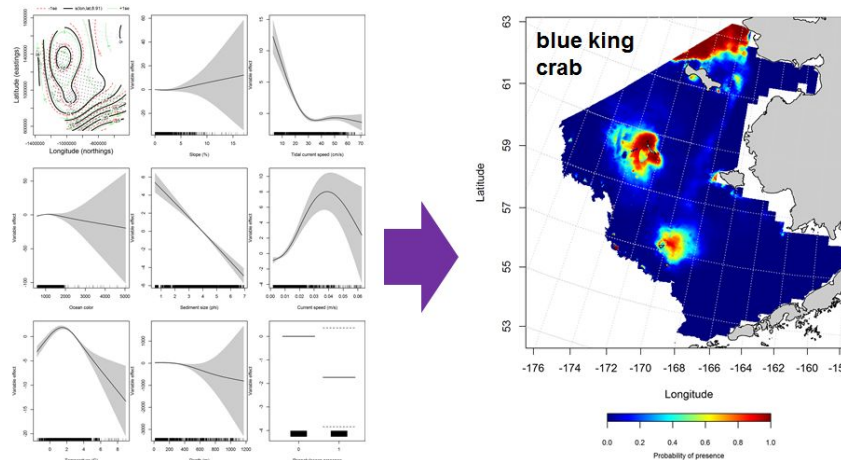
Status of ecosystem data

- Trawl survey data - currently in RACEBASE
 - AKFIN database
 - RACE trawl survey data portal
- Bathymetry, sediment and derived products (AI and parts of GOA)
 - RACE website (<http://www.afsc.noaa.gov/RACE/groundfish/Bathymetry/default.htm>)
- ROMS model outputs - PMEL
- Model outputs - RACE & AKRO
- Methods-Results available in draft NOAA Tech Memos.



Prediction

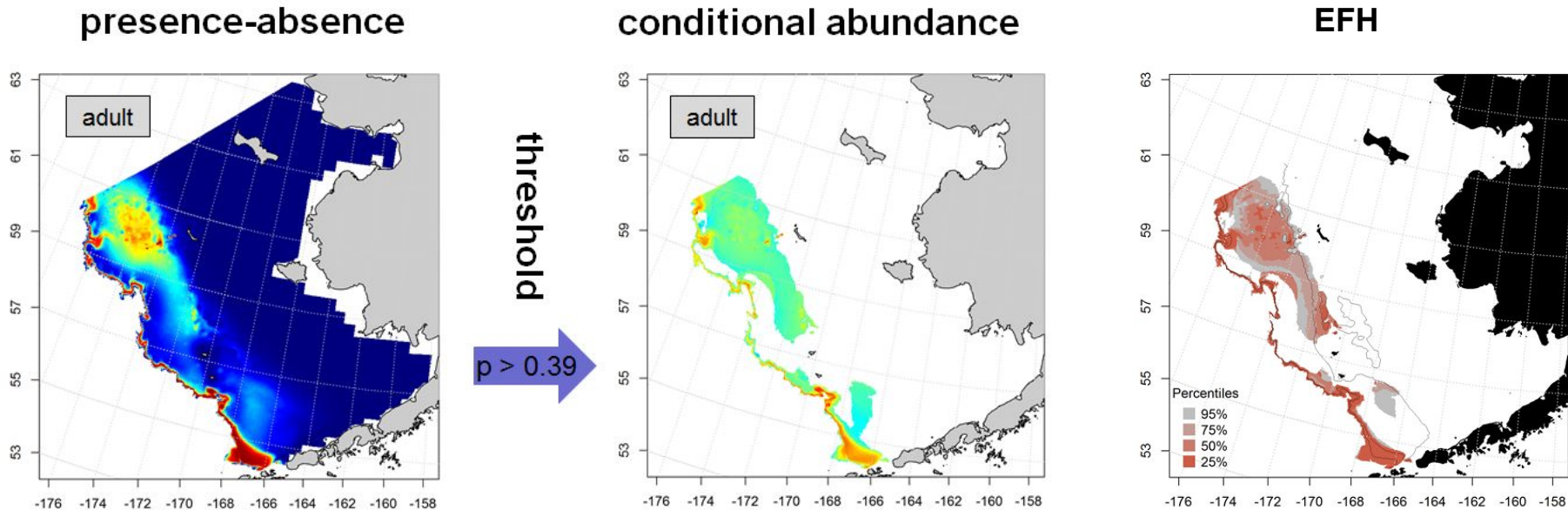
$\sim (\text{longitude} \times \text{latitude}) + \text{depth} +$
 $\text{temperature} + \text{sediment size} + \text{slope}$



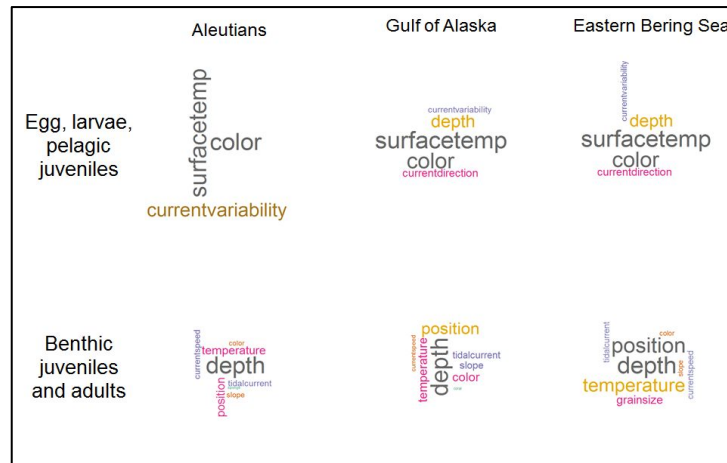
Inclusion into management advice

What did we produce?

Maps on 100 m x 100 m grid for all of Alaska showing distribution, abundance and EFH of FMP species by season, life history stage (n > 400)



Importance of variables
by species life history
stage and season



**ONGOING ANALYSIS TO
LOOK AT EFH
CHANGES UNDER
CLIMATE SCENARIOS**

Where has this information been included in management advice?

1. Alaska regional office is in the process of revising EFH descriptions for the species modeled during this study
2. Based on the revised EFH descriptions the NPFMC will decide if FMP Amendments are necessary

How was inclusion decided?

1. Alaska Regional office requested the analysis and information
2. Alaska Regional office provided funding
3. Periodic review and redescription is mandated under the law when new or better information comes available

Peer review paths

EFH Descriptions NPFMC Products

1. Individual stock assessor review
2. SSC review
3. Council, Ecosystem Committee, AP review

EFH Descriptions Science Products

1. Three NOAA Tech Memo's (currently in review process)
2. Peer-reviewed manuscript (in prep)

Communication to managers, partners, stakeholders and the public

EFH Descriptions Outreach - low profile

2015

- ½ day workshop at AFSC (May)
- Ecosystem Committee
- NPFMC February (SSC)
- Individual outreach to stock assessment authors
- international presentation (PICES)

2016

- Draft Tech Memo's released describing methods and results
- NPFMC April (SSC, AP, EC, NPFMC)
- public presentations (AMSS, WGC, RACE Seminar)
- Individual outreach to stock assessment authors

Strengths of AFSC EFH and Coral approach

- Responsive to requests for analyses and new data
- Funding mechanism (HEPR-AKRO) is generally available to support the requested work
- Mechanisms for outreach are available for high profile projects
 - Engaged industry and NGO stakeholders
 - Open council and ecosystem committee process
 - AFSC encourages open & engaged process

Weaknesses of AFSC EFH and Coral approach

- Difficult to answer the question of how reductions in EFH or coral habitat directly affect fisheries
 - 2 degree temp increase - 1 m sea level rise - NYC underwater
 - We need to get to this point with EFH and coral
- Without a specific request from management research might not have a clear path to funding or dissemination
 - Even if it is a council priority (i.e. Aleutian closure evaluation)
- No coherent annual index of “habitat health” in a place like Ecosystem Considerations chapter
- Working on EFH and coral is generally voluntary (sideline from other duties)
 - receives relatively low ranking in AFSC priorities list, but relatively high level of funding